

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)

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**(PCT Article 36 and Rule 70)**

Applicant's or agent's file reference <b>PH0375 - PCT</b>	<b>FOR FURTHER ACTION</b> See Form PCT/APEA/416	
International application No. <b>PCT/GB2004/004379</b>	International filing date (day/month/year) <b>14.10.2004</b>	Priority date (day/month/year) <b>17.10.2003</b>
International Patent Classification (IPC) or national classification and IPC <b>G06T11/00</b>		
<b>Applicant</b> <b>HAMMERSMITH IMANET LIMITED et al.</b>		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 8 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> <i>(sent to the applicant and to the International Bureau) a total of sheets, as follows:</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</i></p> <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>		
Date of submission of the demand <b>04.10.2005</b>	Date of completion of this report <b>27.01.2006</b>	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer <b>Deltom, J-M</b> Telephone No. +31 70 340-3468	



# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
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## Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3 and 23.1(b))
    - publication of the international application (under Rule 12.4)
    - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

### Description, Pages

1-17 as originally filed

### Claims, Numbers

1-16 as originally filed

### Drawings, Sheets

1/6-6/6 as originally filed

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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## **Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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### **1. Statement**

Novelty (N)	Yes:	Claims	1-16
	No:	Claims	
Inventive step (IS)	Yes:	Claims	8-13
	No:	Claims	1-7,14,15,16
Industrial applicability (IA)	Yes:	Claims	1-16
	No:	Claims	

### **2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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## **Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

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**Re Item V.**

**1. Reference is made to the following document:**

**D1:** BLOOMFIELD P. ET AL.: "The design and implementation of a motion correction scheme for neurological PET" PHYS. MED. BIOL., vol. 48, 21 April 2003, pages 959-978

**D2:** LEE K.J. AND BARBER D.C.: "Use of forward projection to correct patient motion during SPECT imaging" PHYS. MED. BIOL., vol. 43, 1998, pages 171-187

**D3:** QI J. AND HUESMAN R.H.: "CORRECTION OF MOTION IN PET USING EVENT-BASED REBINNING METHOD: PITFALL AND SOLUTION" J. NUCL. MED., 19 June 2002, page 146P

**2. INDEPENDENT CLAIMS 1, 14, 15 AND 16**

**2.1 Claim 1**

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

The document D1 discloses (the references in parentheses applying to this document):

A method of conducting motion correction for a tomographic scanner (abstract, section 1) including a detector array for detecting radiation to generate detector data (section 2.1), wherein the method comprises:

- storing detector data collected during a data acquisition period, said detector data being indicative of (section 2.1):
  - i) directions along which radiation is detected; and
  - ii) quantities of radiation detected in different of said directions;

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- storing movement data representing movement of the subject during the data acquisition period (section 2.2); and
- motion correcting said detector data using said movement data and a motion correction algorithm to calculate motion corrected detector data (section 3),

wherein said motion correcting step comprises processing said detector data by:

- (a) realigning directions of at least some of said detector data on the basis of said movement data (page 965, 6-18); and
- (b) altering quantities of at least some of said detector data on the basis of said movement data (page 965, lines 19-26),

such that at least some of said detector data are both realigned and altered in quantity (page 965, lines 6-26),

The further point of claim 1 wherein said altering quantities step comprises calculating estimates of first detector data based on second, different, detector data, is already contained in the motion correction step of the sinogram data: a given bin (at a given radial and angular position) in the realigned sinogram depending on the value of the raw (pre-alignment) sinogram at another radial and angular position.

**2.2 Claims 14,15 and 16**

Claims 14, 15 and 16 correspond respectively in terms of computer software, data carrier and system to the method of Claim 1. The subject-matter of said claims 14, 15 and 16 is therefore also considered not new (Article 33(2) PCT).

**3. DEPENDENT CLAIMS 2-13**

Dependent claims 2-4-and-9-13 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty or inventive step, the reasons being as follows:

**3.1 Claim 2**

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The use of forward projection for motion correction on tomographic scanner data is disclosed in document D2 (section 2.2). It would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to a method according to document D1, thereby arriving at a method according to claim 2.

The subject-matter of claim 2, therefore, does not involve an inventive step in the sense of Article 33(3) PCT.

**3.2 Claims 3 and 4**

The features of claims 3 and 4 is already disclosed in document D3 (Abstract). The normalization step including a rescaling of the detector data and taking into account the movement of the patient (i.e. missing data). It would be obvious to the person skilled in the art to apply these features with corresponding effect to a method according to document D1, thereby arriving at a method according to claim 3 and 4. The subject-matter of claims 3 and 4, therefore, does not involve an inventive step in the sense of Article 33(3) PCT.

**3.3 Claim 9**

The feature of Claim 9 is already disclosed in document D1 (Abstract, section 1 and section 3). The subject-matter of said claim 9 is therefore also considered not new (Article 33(2) PCT).

**3.4 Claim 10**

The feature of Claim 10 is already disclosed in document D1 (section 3). The subject-matter of said claim 10 is therefore also considered not new (Article 33(2) PCT).

**3.5 Claim 11**

The feature of Claim 11 is already disclosed in document D1 (page 965, lines d30-33). The subject-matter of said claim 11 is therefore also considered not new (Article 33(2) PCT).

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**3.6 Claim 12 and 13**

The feature of Claim 12 and 13 is already disclosed in document D1 (abstract, section 1, section 2.1). The subject-matter of said claims 12 and 13 is therefore also considered not new (Article 33(2) PCT).

**4. CLAIMS 5-8**

The document D3 is regarded as being the closest prior art to the subject-matter of claim 5. The subject-matter of claim 5 differs from this known method in that the rescaling is applied to LORs depending on the fraction of visible LORs in the scanner due to patient movement.

The subject-matter of claim 5 is therefore novel (Article 33(2) PCT).

The problem to be solved by the present invention may therefore be regarded as how to avoid the noise artifacts due to the rescaling LORs having very low readings.

The solution to this problem proposed in claim 5 (provided the meaning of "selectively" is interpreted as in claim 8, cf. the clarity remark in Item VIII below) of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: The selective correction of sinograms, while taking into account the missing data due to undetectable LORs, based on the comparison of the scaling factor with a threshold in order to determine whether to rescale said detector data or replace it with an estimated is considered to provide an improved method of motion correction in tomographic data processing.

Claims 6-8 are dependent on claim 8 and as such also meet the requirements of the PCT with respect to novelty and inventive-step.

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**Re Item VIII.**

The application does not meet the requirements of Article 6 PCT, because the subject-matter of claims 4 and 5 is not clear.

**1. CLAIM 4**

The wording "altering a quantity" is unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT.

**2. CLAIM 5**

The wording "selectively" is vague and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT.